Amendments to the Specification are as follows:

Please replace the paragraph beginning on page 1, line 12 as follows:

In recent years, a force-applying biwire input device (hereinafter referred to as a "force-applying input device" in the specification) has been proposed in place of a mechanical input device for transmitting an operation state of an operation section to a control section through a mechanism. The force-applying input device applies a predetermined force to an operation section by converting an operation state of the operation section into an electrical signal, by transmitting the electrical signal to a control section, and by controlling drive of an actuator, such as an electric motor[[;]], and [[is]] increase[[ing]]es its range of application. Various types of force-applying input devices are available. They include a sliding force-applying input device, a lever force-applying input device, a rotary force-applying input device, and a joystick force-applying input device. The sliding and the lever force-applying input devices allow reciprocatory operation of the operation section in only one direction. The rotary force-applying input device allows reciprocatory rotational operation of the operation section only around one axis. The joystick force-applying input device allows operation of the operation section in any direction.

Please replace the paragraph beginning on page 2, line 25 as follows:

The present inventors [[et al.]] have not been able to find any related-art documents disclosing a description related to the present invention up to the present time.

Please replace the paragraph beginning on page 3, line 7 as follows:

(1) when the operation section is operated in one direction from a start position, driving force of the actuator, that is, an external force with respect to the operation section, must act in a direction opposite to the operation direction of the operation section,

Please replace the paragraph beginning on page 4, line 6 as follows:

However, when such structures are used, application of a predetermined external force which is similar to the frictional force to the operation section is continued even after the operator stops operating the operation section. Therefore, each time the operator takes his/her hand off the operation section, the following is repeated: the operation section return[[ing]]s ~~of the operation section~~ in the direction opposite to the operation direction prior to stopping the operation by the external force, the position sensor detect[[ion]]s [[of]] the direction and amount of this returning movement ~~by the position sensor~~, and the actuator applies ~~application of~~ the predetermined external force, which is similar to the frictional force, ~~by the actuator~~ in a direction opposite to the returning direction ~~are repeated~~. Consequently, Condition (3) cannot be satisfied.

Please replace the paragraph beginning on page 4, line 28 as follows:

That is, in the case in which the direction and amount of operation of the operation section is detected by the position sensor, the control section controls [[and]] the driving of the actuator ~~is controlled by the control section~~ based on the position signal output from the position sensor so that the predetermined external force corresponding to the frictional force is applied in [[the]] a direction opposite to the ~~operation~~ direction of the operation section.[[, when]] When the operation section is operated in an X axis direction, and[[,]] then[[,]] is operated in a Y axis direction from a position reached by the operation in the X axis direction, Conditions (1) and (2) cannot be satisfied. This is because, a resultant [[of an]] external force component corresponding to the amount of operation in the X axis direction and ~~an external force component corresponding~~ to the amount of operation in the Y axis direction is applied to the operation section with a magnitude of $(\sqrt{2}) \cdot$ Fmax (when the magnitudes of the external force components in the respective directions are Fmax), and at an angle of 45 degrees with respect to the X and Y axis directions ~~and the Y axis direction to the~~

~~operation section~~ based on the position signal output from the position sensor. In addition, when the operator takes his/her hand off the operation section, the operation section return[[ing]]s ~~of the operation section~~ at an angle of 45 degrees with respect to the X and Y axis directions ~~and the Y-axis direction by~~ due to: the resultant force [[which]] that acts upon the operation section, detection of the direction and amount of this returning movement by the position sensor, and application of a predetermined external force which is similar to the frictional force by the actuator in a direction opposite to the returning direction. These actions are repeated. Therefore, Condition (3) cannot be satisfied.

Please replace the paragraph beginning on page 6, line 9 as follows:

To this end, according to the present invention, there is provided a force-applying input device ~~force-applying input device~~ comprising a joystick operation section, a position sensor for detecting an operation state of the operation section, an actuator for applying an external force to the operation section, and a control section for controlling drive of the actuator based on a position signal output from the position sensor. The control section computes operation amounts and operation directions of the operation section based on the position signal, and controlling the drive of the actuator, wherein,

Please replace the paragraph beginning on page 6, line 26 as follows:

when the operation amount of the operation section reaches the predetermined operation amount, [[the]] an external force corresponding to ~~that when~~ the predetermined operation amount ~~is reached~~ is applied in [[the]] a direction opposite to the operation direction of the operation section,

Please replace the paragraph beginning on page 7, line 11 as follows:

when the operation direction of the operation section is changed during the operation of the operation section, a direction and amount of application of [[the]] an external force is repeatedly computed to be applied to the operation

section when a predetermined operation amount is reached, wherein the computed external force comprises ~~in which~~ a resultant having [[of]] a first component applied in [[the]] a direction opposite to the operation direction of the operation section prior to changing the operation direction and a second component applied in a direction opposite to the operation direction of the operation section after changing the operation direction ~~is equal to the external force corresponding to that applied to the operation section when the predetermined operation amount is reached is repeatedly computed in order to apply the external force equal to the resultant in the computed external force application direction~~. The first component is gradually reduced and the second component is gradually increased with an increase in the operation amount of the operation section after changing the operation direction.

Please replace the paragraph beginning on page 7, line 28 as follows:

Accordingly, when the operation section is operated in one direction from the start position, an external force which increases with an increase in the operation amount of the operation section is applied in the direction opposite to the operation direction of the operation section until the operation amount reaches [[the]] a predetermined operation amount. In addition, when the operation amount of the operation section reaches the predetermined operation amount, [[the]] a maximum external force ~~corresponding to that when the predetermined operation amount is reached~~ is applied in the direction opposite to the operation direction. In such a case, the aforementioned Conditions (1) and (2) can be satisfied, so that a force which is similar to frictional force is applied to the operation section.

Please replace the paragraph beginning on page 8, line 28 as follows:

When the operation direction of the operation section is changed during the operation thereof ~~the operation section~~, [[the]] a resultant of the external force component applied in [[the]] a direction opposite to the operation direction of the

operation section prior to changing the operation direction, and the external force component applied in [[the]] a direction opposite to the operation direction of the operation section after changing the operation direction is set equal to the external force applied to the operation section when the operation amount reaches the predetermined operation amount. In this case, the external force can be maintained at a constant value before and after changing the operation direction. Therefore, it is possible for the operator to experience an operational feel like that experienced when frictional force acts upon the operation section.

Please replace the paragraph beginning on page 10, line 14 as follows:

Accordingly, when the increase in the external force until the operation amount of the operation section reaches the predetermined operation amount from the start position, and the reduction in the external force until the returning amount of the operation section reaches the predetermined returning amount from the stopping position are computed in accordance with linear functions having slopes greater than 0~~, by properly setting the slopes of the linear functions,~~ a predetermined external force can be applied to the operation section at substantially the time in which the operation of the operation section is started. Therefore, it is possible for the operator to experience an operational feel like that experienced when frictional force acts upon the operation section.

Please replace the paragraph beginning on page 14, line 13 as follows:

The first actuator 3 is connected to the lever holding shaft 12, and the second actuator 4 is connected to the swing arm 13. The first actuator 3 and the second actuator 4 may be electric devices, such as motors or solenoids, or other~~.~~ ~~When~~ direct operated devices.[[,]] When direct operated devices ~~such as linear motors or solenoids,~~ are used as the actuators 3 and 4, a predetermined power transmission device is disposed between the actuator 3 and the lever holding shaft 12, and/or between the actuator 4 and the swing arm 13, for converting the rotational motion of the lever holding shaft 12 and/or the swing arm 13 into linear

motion and transmitting the linear motion ~~is disposed between the actuator 3 and the lever holding shaft 12 or between the actuator 4 and the swing arm 13~~.

Please replace the paragraph beginning on page 15, line 6 as follows:

As shown in Fig. 1, the control section 7 comprises an input section 21, a computing section 22, a storage section 23, driver circuits 24 and 25, and a central processing unit (CPU) 26. The input section 21 is used for inputting the first position signal output a from the first position sensor 5 and the second position signal b output from the second position sensor 6. The computing section 22 computes drive signals e and f of the first and second actuators 3 and 4 for applying a predetermined force to the operation section 2, based on the first and second position signals a and b. The storage section 23 stores, for example, predetermined operation amounts, and functions and coefficients serv[[ing]]e as a basis for the computation. The driver circuits 24 and 25 drive the first and second actuators 3 and 4 by outputting drive powers c and d in accordance with the drive signals e and f output from the computing section 22. The CPU 26 controls each of the[[se]] parts 21 to 25. ~~In the embodiment, the~~ The functions which are stored in the storage section 23 [[are]] include linear functions, in which the first and second position signals a and b are used as variables, and [[the]] have slopes [[are]] greater than 0, and exponential functions, in which the first and second position signals a and b are used as variables, and [[the]] have exponents [[are]] greater than 1.

Please replace the paragraph beginning on page 17, line 15 as follows:

As shown in Fig. 4A, the operator operates the operation section 2 in a straight line to point P1 from a start position A through points P0 and B, and[[,]] then[[,]] stops operating the operation section 2 at P1 and takes his/her fingers off the operation section 2. Fig. 4 B shows the operations of Fig. 4A being carried out by [[When]] the operator. ~~carries out these operations, as shown in Fig. 4B, during a time in which the operator operates the operation section 2 from~~

From the start position A to point P0 where the operation amount is equal to the predetermined operation amount stored in the storage section 23, external force applied in the point A direction by driving the actuators 3 and 4 gradually increases from 0 in accordance with the amount of operation of the operation section 2, and becomes equal to a maximum value Fmax at point P0. Thereafter, the external force equal in value to the maximum value Fmax is applied until the operation section 2 reaches a stopping point P1. When the operation section 2 reaches the stopping point P1 and the operator takes his/her fingers off the operation section 2, and during a time in which the operation section 2 returns from the stopping point P1 to point B, the external force applied in the point A direction by driving the actuators 3 and 4 is gradually reduced from the maximum value Fmax in accordance with the returning amount of the operation section 2, and becomes 0 at point B. At point B, the returning amount is equal to the predetermined returning amount stored in the storage section 23. By this, a certain resistance is applied to the operation of the operation section 2 during the operation of the operation section 2, and the operation section 2 can be reliably stopped when the operation of the operation section 2 is completed. Therefore, a force can be applied as if frictional force of a mechanism is applied to the operation section 2, and the operation section 2 can provide a proper operational feel.

Please replace the paragraph beginning on page 18, line 20 as follows:

(6) When the operation direction of the operation section 2 is changed during the operation thereof, ~~based on an exponential function stored in the storage section 23,~~ the drive signals e and f of the respective actuators 3 and 4 required for generating the external force are repeatedly computed based on an exponential function stored in the storage section, in which a resultant of a component applied in the direction opposite to the operation direction of the operation section 2 prior to changing the operation direction and a component applied in a direction opposite to the operation direction of the operation section

2 after changing the operation direction becomes equal to the maximum value Fmax ~~is repeatedly computed~~. ~~Here, after~~ After changing the operation direction, with an increase in the amount of operation of the operation section 2, the component applied in the direction opposite to the operation direction of the operation section 2 prior to changing the operation direction is gradually reduced and the component applied in the direction opposite to the operation direction of the operation section 2 after changing the operation direction is gradually increased. By this computation, as shown in Fig. 6, returning positions Bn (B1, B2, B3, ...) of the operation section 2 after changing the operation direction are uniquely determined.

Please replace the paragraph beginning on page 19, line 14 as follows:

(7) When the operation section 2 is stopped, by the amounts of changes in the position signals a and b, a returning amount and a returning direction (point Bn direction) of the operation section 2 are computed. The drive signals e and f required for generating the external force in a direction opposite to the returning direction of the operation section 2 are repeatedly computed based on a negative linear function stored in the storage section 23 until [[Until]] the returning amount of the operation section 2 reaches a predetermined returning amount equivalent to the predetermined operation amount stored in the storage section 23~~, based on a negative linear function stored in the storage section 23, the drive signals e and f of the respective actuators 3 and 4 required for generating the external force in a direction opposite to the returning direction of the operation section 2 are repeatedly computed~~.

Please replace the paragraph beginning on page 20, line 1 as follows:

Therefore, as shown in Fig. 5A, when the operator operates the operation section 2 in a straight line from the start position A to point P1 through point P0 and point B, [[then,]] changes the operation direction of the operation section 2 and operates it to P2, and[[,]] then[[,]] takes his/her fingers off the operation

section 2, the following operations are performed as shown in Fig. 5B. ~~That is, during~~ During the time in which the operation section 2 is operated from the start position A to point P0 where the operation amount is equal to the predetermined operation amount stored in the storage section 23, the external force applied in the point A direction by driving the actuators 3 and 4 is gradually increased from 0 in accordance with the amount of operation of the operation section 2, and becomes equal to the maximum value Fmax at point P0. Thereafter, until the operation section 2 reaches the stopping point P2, the external force equal to the maximum value Fmax is applied in the point A direction. However, after changing the operation direction of the operation section 2, as shown in Fig. 6, the direction of application of the external force (maximum value Fmax) changes successively in accordance with the amount of operation of the operation section 2[[, and]]. Additionally, the component of force in the direction opposite to the operation direction of the operation section 2 after changing the application direction increases gradually based on an exponential function stored in the storage section 23[[, and]]. Likewise, the component force in the direction opposite to the operation direction of the operation section 2 prior to changing the application direction is gradually reduced based on an exponential function stored in the storage section 23. By this, a constant external force is always applied to the operation section 2, and the application direction is smoothly changed from the direction opposite to the operation direction of the operation section 2 prior to changing the application direction to the direction opposite to the operation direction of the operation section 2 after changing the application direction. Therefore, a force like frictional force of a mechanism acting upon the operation section 2 can be applied, and the operation section 2 can provide a proper operational feel. When the operation section 2 reaches the stopping point P2 and the operator takes off his/her fingers from the operation section 2, and during a time in which the operation section 2 returns from the stopping point P2 to point Bn where the returning amount is equal to the predetermined returning amount stored in the storage section 23, the external force applied in the point A

direction ~~by driving the actuators 3 and 4~~ is gradually reduced from the maximum value Fmax in accordance with the returning amount of the operation section 2, and becomes 0 at point B.

Please replace the paragraph beginning on page 21, line 22 as follows:

In [[the]] force-applying input device ~~of the embodiment~~, when the operation section 2 is operated in one direction from the start position A, an external force which increases with an increase in the operation amount of the operation section 2 is applied in the direction opposite to the operation direction of the operation section 2 until the operation amount reaches a predetermined operation amount. In addition, when the operation amount of the operation section 2 reaches the predetermined operation amount, the external force (maximum value Fmax) corresponding to that ~~when the~~ predetermined operation amount ~~is reached~~ is applied in the direction opposite to the operation direction of the operation section 2. Therefore, it is possible to apply a force which is similar to frictional force to the operation section 2.

Please replace the paragraph beginning on page 23, line 26 as follows:

In [[the]] a force-applying input device ~~of the embodiment~~, a predetermined external force can be applied to the operation section 2 at substantially the time in which the operation of the operation section 2 is started by computing, with the use of linear functions having slopes greater than 0, ~~when~~ the increase in the external force until the operation amount of the operation section 2 reaches the predetermined operation amount from the start position A and the reduction in the external force until the returning amount of the operation section reaches the predetermined returning amount from the stopping position ~~are computed in accordance with linear functions having slopes greater than 0, by properly setting the slopes of the linear functions, a predetermined external force can be applied to the operation section at substantially the time in which the operation of the operation section 2 is started~~. Therefore, it is possible for the

operator to experience an operational feel like that experienced when frictional force acts upon the operation section 2.

Please replace the paragraph beginning on page 24, line 13 as follows:

In [[the]] a force-applying input device ~~of the embodiment, in the case in which~~ where the operation direction of the operation section 2 is changed, and when the direction of application of the external force is computed in accordance with an exponential function having an exponent greater than 1, it is possible to smoothly change the direction of application of external force to the operation section 2 from the direction opposite to the operation direction of the operation section prior to changing the operation direction to the direction opposite to the operation direction of the operation section after changing the operation direction. Therefore, the operator less frequently experiences an unpleasant feeling when operating the operation section 2, that is, the operator can experience an operational feel like that experienced when frictional force acts upon the operation section 2.

Please replace the paragraph beginning on page 24, line 28 as follows:

~~In the embodiment, a~~Although one may compute, with the use of linear functions having slopes greater than 0, the increase in the external force applied until the amount of operation of the operation section 2 reaches the predetermined operation amount from the start position A, and the reduction in the external force applied until the returning amount of the operation section reaches the predetermined returning amount from the stopping position ~~are computed in accordance with linear functions having slopes greater than 0;~~ and although the direction of application of the external force is computed in accordance with exponential functions having exponents greater than 1 when the operation direction of the operation section 2 is changed, the [[gist]] scope of the present invention is not limited thereto. Therefore, [[they]] the amount and

direction of external forces applied to the operation section 2 can be computed in accordance with [[any]] other functions as apparent to those skilled in the art.